A Review on Anticipated Breakthrough Technologies of 21st Century

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ABSTRACT

This paper discuss thirteen most anticipated possible technology breakthroughs of 21st century which are substantially affect the life style of living beings in the world like (1) Nanotechnology based human life comfort, (2) High speed computation through optical & quantum computers, (3) Embedded Intelligence, (4) HIV Antivirus, (5) Pseudo Senses - Sensation of existence through virtual reality, through artificial environment, (6) Off Planet Production in micro-gravity, (7) Protein Maps to know how many active genes are coding for proteins in living being, (8) Customized Kids which are used for Customization of Physical and mental ability of children, (9) Development of Chameleon Chips which are reconfigurable photonic circuits using the idea of optical solitons, (10) Flying cars through manipulation of gravitational force, (11) Immortality through nano-bio-technology & stem cell research, (12) Fractal Models for fragmented geometry shapes, and (13) Space travel for everybody. The paper also discuss the effect of these technology breakthroughs and possible changes in lifestyle of people in the society and its contribution in solving many basic problems of human beings on the earth.

Keywords : Breakthrough technologies of 21st Century, Optical computing, Off-planet production, Nanotechnology, Protein mapping.

I. INTRODUCTION

Every rational person in this world constantly aims to improve his standard of living. Forecasting the future of technology is important for dreamers who hope to innovate better tools and techniques and for the mainstream people who hope to benefit from such new and improved technologies. Many inventions are born in the lab and never enters into the consumer market, while others evolve beyond the expectation of putting good regulations on their use. Since the beginning of the 21st century, mankind has made tremendous strides and struggles in developing new technologies. While machines can replicate many movements and actions of humans, the next challenge lies in teaching them to think for themselves and react to changing conditions [1]. For example, the field of artificial intelligence will one day give machines the ability to think analytically, using concepts and advances in computer science, robotics and math. Exploring space will also push genetic research. *Better Humans* author Simon Smith claims environments such as Mars extreme cold temperatures and toxic atmosphere will require biological changes. Sending humans into space without genetic modification would be impractical. However, we need breakthroughs to achieve this glowing future. Gene therapies to protect space travelers in hostile environments are at least, 15-to-20 years away; and faster propulsion, maybe even wormhole development, are needed to travel huge space distances in a timelier manner. Similarly, many anticipated technology breakthroughs are expected to change the lifestyle, comfort and thinking of human beings in near future [2]. Will these breakthroughs happen? Experts believe technologies will develop at lightning speeds during this century. Between now and 2035, we could see more breakthroughs than in the last 200 years. From 2035-to-2050, advances might outpace all of human history; and from 2050-to-2100, massive discoveries beyond the wildest imaginings of science fiction could appear. As we trek into this future, aided by technologies we cannot even imagine today, it's easy to predict and believe that sometime during the 22nd century, more humans will live in space than on Earth. In addition, these hearty pioneers will never be more than a "thought call" away, because sharing experiences of life in a strange new world will enrich us all. This paper discuss thirteen, the most anticipated possible technology breakthroughs of 21st century which are substantially affect the life style of living beings in the world like (1) Nanotechnology based human life comfort, (2) High speed computation through optical & quantum computers, (3) Embedded Intelligence, (4) HIV Antivirus, (5) Pseudo Senses - Sensation of existence through virtual reality, through artificial environment, (6) Off Planet Production in micro-gravity, (7) Protein Maps to know how many active genes are coding for proteins in living being, (8) Customized Kids which are used for Customization of Physical and mental ability of children, (9) Development of Chameleon Chips which are reconfigurable photonic circuits using the idea of optical solitons, (10) Flying cars through manipulation of gravitational force, (11) Immortality through nano-bio-technology & stem cell research, Fractal Models for fragmented geometry shapes, and (13) Space travel for everybody. The effect of these technology breakthroughs and possible changes in lifestyle of people in the society and its contribution in solving many basic & advanced problems of human beings on the earth are also discussed.

II. SOME OF MAJOR ANTICIPATED BREAKTHROUGHS OF THIS CENTURY :

Based on various factors which solves basic needs and advanced comfortability of human life, the technology breakthrough model consisting of nanotechnology and interrelated technologies and a set of independent technologies are derived by a qualitative data collection instrument namely focus group method [3, 4]. The block diagram of such a system is shown in Fig. 1. The anticipated breakthrough technologies are divided into two groups and listed below :

Interrelated Technologies :

(1) Nanotechnology
(2) Optical Computation
(3) Embedded Intelligence
(4) Chameleon Chips
(5) Flying cars
(6) Immortality through nano-bio-technology
(7) Space travel

Independent Technologies :

(1) HIV Antivirus
(2) Pseudo Senses
(3) Off Planet Production
(4) Protein Maps

(5) Customized Kids
(6) Fractal Models

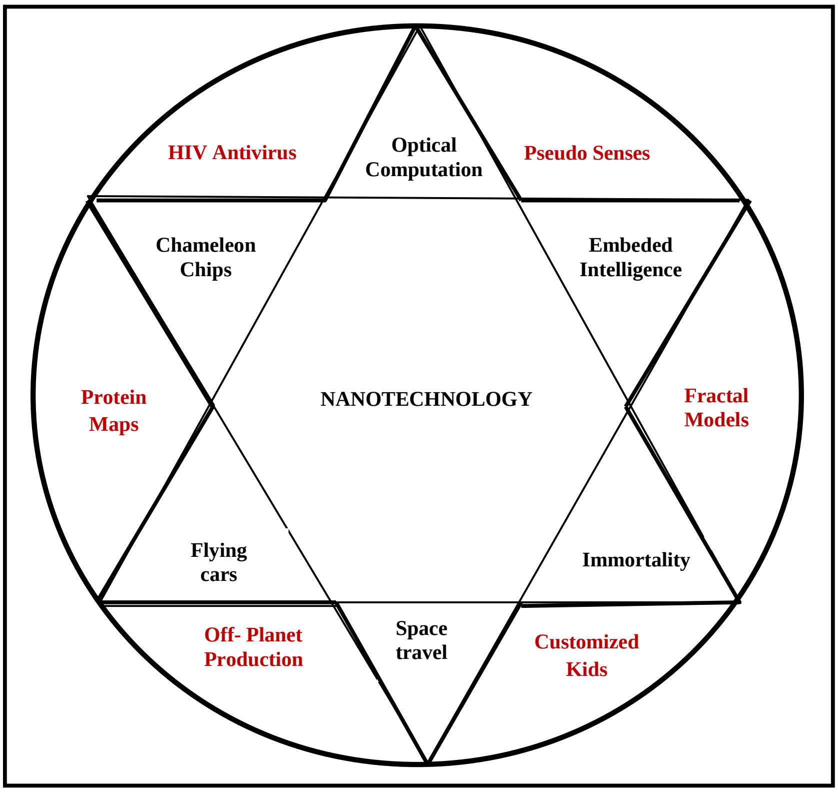

Fig. 1 : Block diagram to represent interrelated & independent technologies.

(1) Nanotechnology :
Nanotechnology is the manipulation of matter at a scale of 1 to 100 nanometers. Using nanotechnology we can control molecules at an atomic level and create materials with unique properties. Fundamentally the properties of materials can be changed by nanotechnology. We can arrange molecules in a way that they do not normally occur in nature. The material strength, electronic and optical properties of materials can all be altered using nanotechnology. There are different means like lithography, self-assembly, bottom-up methods to manipulate nanomaterials. Nanotechnology is the first major worldwide research initiative of the 21st century. Nanotechnologies are applied to cross industrial problems and are a general purpose technology that acts as both a basis for technology solutions or at the convergence of other enabling technologies, like biotechnologies, computational sciences, physical sciences, communication technologies, cognitive sciences, social psychology and other social sciences. Nanotechnologies are pervasive solution vectors in our economic environment. It is necessary to develop new methods to assess nanotechnologies development to better understand nanotechnology based innovation. As general purpose and enabling technologies, nanotechnologies reveal commercialization processes, from start-ups to large firms in collaboration with public sector research, and which lead to changing patterns of industrial organization which influence public policy initiatives to foster their development [5-7].

Nanotechnologies are not only general purpose technologies – they are also technologies that enable the creation of new devices and new ways to improve the quality of life. Nanotechnologies are embedded in existing industries and research using nanotechnologies are developed within existing fields, transforming them from microelectronics to nano-electronics, from biotechnologies to nano-bio-technologies, and from energy to nano energy. Firms are exploring new ways to address consumer needs, new business models based on the changes nanotechnologies could enable in existing industries. Huge public investments to support scientific and technological researches, the creation of technological and industrial platforms and infrastructures have led to more than 2,000,000 articles related to nanotechnologies being published, and over 1,000,000 applications lodged with patent offices.

Nanotechnology has the potential to change every part of our lives. Nanotechnology affects all materials like ceramics, metals, polymers, and biomaterials. In the coming decade nanotechnology will have an enormous impact. Future advances could change our approaches to manufacturing, electronics, IT & communications technology, space technology, agriculture & food technology, renewable energy, biotechnology and medicine, making previous technology redundant and leading to applications which could not have been developed or even thought about, without this new approach. Nanotechnology will play major role in solving all the problems of humans like food, drinking water, energy, health, environment and many other areas including life span expansion.

Application areas of Nanotechnology :

1. Medicine : Drug delivery, Therapy techniques, Diagnostic techniques, Antimicrobial techniques, Cell repair, Cancer detection & curing, Gene therapy, Nanotech in regenerative medicine & tissue engineering, Life extension etc.
2. Electronics : Nanotransistors, Nanogates, Nanodevice based Integrated Circuits, Nanoemmissive display panels, Denser nanomemories, Nanowires, Nanophotonics, Nano-quantum computers.
3. Agriculture & Food : Contamination sensor, Antimicrobial packaging, Enhanced nutrient delivery, Green packaging, Pesticide reduction, Tracking & brand protection, Texture, Flavor, Bacteria identification & elimination.
4. Batteries & Fuel Cells : Nanostructure fuel cells, Hydrogen nanofuel cells, Nanotech alternative fuel cells, Long life high storage capacity fast rechargeable nanotech batteries.
5. Automobile & Space Technology : Space elevator, weight reduction in spaceships and spacesuits, solar power satellites, Bio-nano-machines for space applications, New breed of robots to explore the planets.
6. Cleaner Air & Water : Pollution control, Nanotech windmill blades, Nanostructure membranes, water cleaning nanotechnology, nanoparticle catalysts, Removal of carbon dioxide from industrial smoke stacks, nanotubes as the pores in reverse osmosis membranes, Nanotech based water purifiers.
7. Sensors : Chemical sensors, MEMS based sensors, Nano-hydrogen sensors, Nanocantilevers,
8. Consumer Products : Sporting goods, fabrics & textiles, cosmetics, Skin care products, Sunscreens, Flame retardants, Nanocleaning products, Nanopaints,
9. Renewable Energy : Inexpensive solar cells, capture, storage, & use of energy optimally.
10. Defense : Nano for the soldier, nano for defense vehicles, nano for aeronautics, nano for naval vessels, nanotechnology for weapon systems, nano for satellites, nano for logistics, nano

for security, Nano for military operations at land, Nano for military operations in the air, Nano for military operations at sea, Nanotechnology for urban operations.

11. Civil & Mechanical Engineering Manufacturing : Nano-material technology, nano-processing technology, nano-assembly technology, nano-coating technology, and nano-measurement technology in mechanical manufacturing. Nanorobotics. Micro-ElectroMechanical Systems for accelerometer chips, inkjet nozzles, pressure sensors, microphones, RF switches, gyroscope, oscillators etc.

12. Building Materials : Aerogels, Nanotube mixed concrete, Nanopaints, Building Integrated Photovoltaic's, Nanophotonic material as building cooler. NT on construction, and fire protection. And Many more !!!!!.

Timeline of nanotechnology innovations :

- *Passive Nanostructures (2000-2015) : Nanomaterials, including nanotubes and nanolayers.*
- *Active Nanostructures (2055-2020) : Change their state during use, responding in predicable ways to the environment.*
- *Systems of Nanosystems (2020-2035) : assemblies of nanotools work together to achieve a final goal.*
- *Molecular Nanosystems (2035-2050) : involves the intelligent design of molecular and atomic devices, leading to “unprecedented understanding and control over the basic building blocks of all natural and man-made things.*
- *The Singularity (2050 and beyond): growth rate in NT applications become almost infinite.*

Nanotechnology has many definitions. It is the “understanding and control of matter at dimensions of roughly one to one hundred nanometers, where unique phenomena enable novel applications,” according to the National Nanotechnology Initiative (NNI) Program of United States. The U.S. Environmental Protection Agency (EPA) defines nanotechnology as “research and technology development at the atomic, molecular, or macromolecular levels using a length scale of approximately one to one hundred nanometers in any dimension; the creation and use of structures, devices and systems that have novel properties and functions because of their small size; and the ability to control or manipulate matter on an atomic scale. Scientists have been studying and working with nanoparticles for centuries. But the effectiveness of their work has been hampered by their inability to see the structure of nanoparticles. In recent decades the developments of microscopes capable of displaying particles as small as atoms has allowed scientists to see what they are working with [8-13].

The ability to see nano-sized materials has opened up a world of possibilities in variety of industries and scientific endeavors. Because nanotechnology is essentially a set of techniques that allow manipulation of properties at a very small scale, it can have many applications in all parts of life. Nanotechnology is viewed broadly as many technologies over time are expected to generate numerous new products and applications. Lux Research, Inc., the New York-based nanotechnology research and advocacy firm, predicts that by 2014 products that incorporate nanotechnology will constitute 15 percent of global manufacturing output and will total $2.6 trillion. Products of nanotechnology are diverse and growing exponentially. According to the NNI, nanoparticles and nanoscale materials are used in many industries, including electronics, pharmaceuticals, chemicals, energy, and biomedical, among others. Reportedly, areas producing the greatest revenue for nanoparticles are chemical-mechanical polishing, magnetic recording tapes, sunscreens, automotive catalyst supports, biolabeling, and electroconductive coatings and optical fibers. According to at least one source, there are many nano-enabled products in commerce today. These products include paints, cosmetics, stain-resistant clothing, electronics, surface coatings, and sporting goods, among other applications.

There are many different points of view about the nanotechnology. These differences start with the definition of nanotechnology. Some define it as any activity that involves manipulating materials between one nanometer and 100 nanometers. However, the original definition of nanotechnology involved building machines at the molecular scale and involves the manipulation of materials on an atomic (about two – tenth of a nanometer) scale. The debate continues with varied opinions about exactly what nanotechnology can achieve. Some researchers believe nanotechnology can be used to significantly extend the human lifespan or produce replicator- like devices that can create almost anything from simple raw materials. Others see nanotechnology only as a tool to help us to do what we do now, but faster or better. The third major area of debate concerns the timeframe of nanotechnology- related advances. Will nanotechnology has significant impact on our day to day lives in a decade or two, or will many of these promised advances take considerably longer to become realities. Only time will tell how nanotechnology will affect our lives. The applications of nanotechnology identified in different areas provides lots of business opportunities which includes Medicine, Electronics, Food, Fuel Cells, Solar Cells, Batteries, Space Travels, Fuel, Better air quality, Cleaner water, Chemical sensors, Sporting goods, Fabric, Cleaning products, Energy, Environment, Health, and Life span increase.

Taking nanotechology from an idea to reality means being able to make some very, very fine and small-scaled tools. Nanotools have to be assembled at the molecular level in order to be tiny enough to perform work at the nano level, and often, the work of nanotechology is so specialized that the tools need to be modeled and made specifically for each job. Handling the tools involves careful and minute planning, as well, because of their delicate balance and scale. In generations to come, those skilled in molecular nanotechology will be in high demand in the workforce [14-15].

Anticipated breakthrough in nanotechnology will soon radically change our lives and world. Researchers and policy makers from around the world believe that nanotech is about to radically transform world economies, improve global environment, and provide a new understanding of what it means to be human. European and U.S. Governments envision that the developing nano-scale domain will ultimately amount to the mastery of all of nature. In this view, there exists a "material unity” where all matter – life and non-life – can seamlessly merge. The ultimate goal of this bold vision is to "improve human performance”, both physically and cognitively; in the home, on the job; everywhere.

(2) High speed computing through optical & quantum computers :
High performance computing through optical computing is the science of making computing work better using optics and related technologies. Optics has the ability to solve hectic problems in computing hardware. With the growth of computing technology the need of high performance computers (HPC) has significantly increased [16]. Even though lot of research is taking place in laboratories, optical computing and processing in space and time has so far failed to move out of the lab in the form of a general purpose device. The construction of optical subsystems directly

on-chip, with the same lithographic tools as the surrounding electronics has been made possible by the advances in these tools, which can now create features significantly smaller than the optical wavelength; experts predict lithographic resolution as fine as 16nm by year 2020 [17]. Optical computation is the most feasible technology that can replace electronics, and promises impressive speeds that can enhance processing power and data rate transmission. Major advantage of optics lies in its interconnection technology which is reflected in the overall performances of the computing and processing machines [18, 19].

The need for optical technology arrives from the fact that present day computers are limited by the time response and speed of electronic circuits. A solid transmission medium limits both the speed and volume of signals, as well as generating heat that damages components. For example, a one-foot length of wire produces approximately one nanosecond of time delay. Extreme miniaturization of tiny electronic components also leads to 'cross-talk' - signal errors that affect the system's reliability. These and other obstacles have led scientists to seek answers in light itself. Light does not have the time response limitations of electronics, does not need insulators, and can even send dozens or hundreds of photon signal streams simultaneously using different color frequencies. Those are immune to electromagnetic interference, and free from electrical short circuits. They have low-loss transmission and provide large bandwidth; i.e. multiplexing capability, capable of communicating several channels in parallel without interference. They are compact, lightweight, and inexpensive to manufacture, as well as more facile with stored information than magnetic materials. By replacing electrons and wires with photons, fiber optics, crystals, thin films and mirrors, researchers are hoping to build a new generation of computers that work 100 million times faster than today's machines [20].

Optical computing was a hot research area in the 1980s. But the work tapered off because of materials limitations that seemed to prevent optochips from getting small and cheap enough to ever be more than laboratory curiosities. Now, optical computers research is back. Researchers are using new conducting polymers to make transistor-like switches smaller and 1,000 times faster than silicon transistors. The electricity-conducting organic molecules much thinner than semiconductor wires are being teased into self-assembling. These advances promise supertiny all-optical chips. The present day electronic computers have continued to advance in speed and memory at an exponential rate, doubling their clock rate every few years or so, there are inherent limitations in all electronic devices. First, electrons cannot move through each other nor can electric currents--they must always be directed through wires of some sort. This means, for example, that three-dimensional interconnections and three-dimensional computers have always been difficult to implement--there would be just too many cross-connecting wires and switches. Optical computers can potentially overcome all disadvantages of present day electronic computers. Light can travel through free space without the need for wires or fibers, and photons can travel through each other without alteration. So optical computers can be designed that are inherently three-dimensional and highly parallel. Elements such as three-dimensional holograms can be accessed by many beams simultaneously, and with other interference effects entire memories can be queried instantaneously, not in serial fashion. Furthermore, energy losses from light traversing free space are negligible, allowing highly energy-efficient devices. Even though electro-optic switches can slow down optical computers, some optical computations, again using interference effects, can be performed literally at the speed of light [21- 23].

Advantages of Optical Computers

Using light instead of electric current brings a lot of advantages. Unfortunately the technology which is needed for optical computers is not highly developed yet. Single high tech components itself are already available but there is no entire optical computer yet. It will take several years and a lot of money to develop miniaturized components and implement them to a complete and integrated concept. Today's optical computers are only prototypes and do not reflect the whole capabilities of optical computing [24]. Some of the advantages of optical computers compared to conventional computers are :

(1) High performance : The most significant advantage of optical computers is the potential of higher performance. The performance of an optical computer in an advanced stage should be several orders of magnitude higher than the conventional computer. Conventional computer technology is based on electric current and electrons. While electric current is very fast, the average drift velocity of electrons is rather slow. In reality there is nothing faster than the speed of light. This makes light and photons to the perfect information carrier. Even long distances can be bridged within split seconds. A computer based completely on optical components is the optimum concerning speed. Using light as information carrier is only one opportunity to accelerate the speed of computers. Using a different architecture for optical computers could be a key factor to success. Optical communication devices are much faster than electric ones so that the bottleneck could disappear.

(2) High parallelism : Another key to fasten up optical computers is to compute with higher parallelism. This implies higher performance and higher bandwidth which is depicted within the next break. There are two options to achieve higher parallelism in computers: One is to increase the amount of data which is sent through bus systems and computed in the CPU at each time. Optical computers can be built with higher bandwidth. Within one data path several data sets can be transmitted parallel at the same time using different wavelengths or polarizations. The higher parallelism and the superior velocity of light allow extreme processing speeds. But to take full advantage of this new architecture operating systems and application software have to be adjusted to it. Furthermore data paths are able to cross each other without interference. This advantage of optical technologies can help to build architectures and layouts with superior parallelism. New layouts can be more three-dimensional and thus the space in a computer case can be used more intensively. With adequate miniaturization of optical components the size of computers could shrink.

(3) Less energy consumption : Current computers consume a lot of energy. Modern CPUs often need over 80 watts in idle state, around 120 watts in normal use and up to 250 watts in performance mode. For complex visualization a high performance graphics card is needed which needs up to 150 watts itself. Today especially for notebooks energy-saving components are built. Another aspect is that a lot of the consumed energy is not used accurately but for idle power in the form of internal friction in the ICs. Still the amount of energy loss due to internal friction rises from CPU generation to generation. Optical computers have the potential to be more power-saving than conventional ones.

(4) Less heat dissipation : Less heat release using light sounds contradictory since light sources radiate heat. But in optical computers lasers are used as light sources. Those concentrated light beams only consist of a small spectrum of different wavelengths. Depending on the field of application lasers have different needs of energy and produce heat to a greater or lesser extent. Most modern CPUs are not able to work without a proper airing. The reason for that is the

friction of the electrons in the integrated circuits. Optical computers could be smaller because there is no need for a fan or free spaces for air circulation.
(5) Less noise : Conventional computers produce noise due to rotating fans and drives. High speed processors accelerated to their architectural limits need enormous active and passive cooling. Optical computers could be almost noiseless since no fan will be needed. Light sources (e.g. lasers) can be cooled with passive coolers and heat pipes built out of aluminum or copper. Those passive coolers evacuate heat silent. Low noise is an interesting aspect for office and home users as well.
(6) Flexibility layout : Conventional PCs are built as a rectangular box (desktop) or as a laptop. One reason for that is the speed of electronic connections. It depends on the length of the cables and pipelines. On the motherboard the CPU, RAM and graphics card have to be close to each other to be able to move huge amounts of information. Longer distances imply the decrease of the practical transfer rate. Using optical components the distance of communication does not matter. Once the signal is in an optical fiber it does not matter whether the signal runs 1 meter or 1000 meters. Because of the low damping long-range communication is possible. Still the data rate is very high and there is no crosstalk. So the optical computer technology has the potential to change the shape and layout of computers fundamentally. The components of one computer can be spread across a car, a building or even a city with almost no loss in performance. Consequently the server/client and the peer-to-peer architectures could be advanced. Many clients, terminals or even single components can be connected optically and consequently allow higher ranges.
(7) Low loss in communication : Today communication often is realized with electric wires or wireless by radio frequency. The ranges of those communication ways are limited. Data sent through wires needs to be amplified several times to bridge longer distances. The communication with optical fibers is almost lossless due to the total internal reflection. So amplifying the signal is not or only rarely needed. Furthermore a higher bandwidth is possible, optical communication is insensible to electromagnetic interfering fields and it is more tap-proof. For high performance communication fiber optics are used.
(8) Less wear : Wear normally occurs at mechanically moving parts. In conventional computers those parts are especially fans, hard disk drives and conventional optical removable storages (CD, DVD, HD-DVD, Blu-ray disks). All those components have in common that they rotate or move very fast and thus friction is caused. Because of this friction the mechanical parts wear out and break. In optical computers fans possibly will not be needed any more. An optical processor does not heat up due to internal friction of the electrons like a conventional does. Additionally new technologies for mass storages can be established. Saving in the form of holograms or on molecular basis is possible. Those forms do not need fast spinning parts and do not wear out so heavily.

Quantum computers :

The idea of quantum computing emerged in the 1970s, and it has received renewed interest lately. Quantum computing applies the principle of quantum physics and quantum mechanics to computers, going beyond traditional physics to work at the subatomic level. Quantum computers differ from conventional computers in that they utilize atom or nuclei working together as quantum bits or qubits. Qubits function simultaneously as both the computer's processor and memory, and each qubit can represent more than just the two states (zero and one) available to today's electronic bits; a qubit can even represent many states at one time. Quantum computers can perform computations on many numbers simultaneously at a time and make them, theoretically exponentially faster than conventional computers. Physically, quantum computers in the future might consists of a thimbleful of liquid whose atoms are used to perform calculations as instructed by an external device. Quantum computing is not well suited for general computing but it is ideal for, and expected to be widely used in high data intensive applications, such as encryption and code braking [25].

Building a Quantum Computer :

- Scientists still don't know how to build a quantum computer. One huge problem is the particles used for calculations must remain in isolation from their surroundings. Because of the consequences created by entanglement, interactions with outside particles could result in faulty results.
- Quantum physicists are working on a number of methods for controlling qubits: atoms or charged ions in an electro-magnetic trap, nuclear magnetic resonance, superconductor microcircuits, quantum dots, atom conveyors and cavity quantum electrodynamics, among others.
- Quantum computing is still largely theoretical and there is no agreement on the best way to build a quantum computer. We don't know what a quantum computer capable of complex computing will look like or even if it is actually possible to build one [26].

It is sure that the scientists of 21st century will make a breakthrough by developing a suitable model and realize such model using suitable materials and components, and algorithms to realize both optical and quantum computers in the society.

(3) Embedded Intelligence :

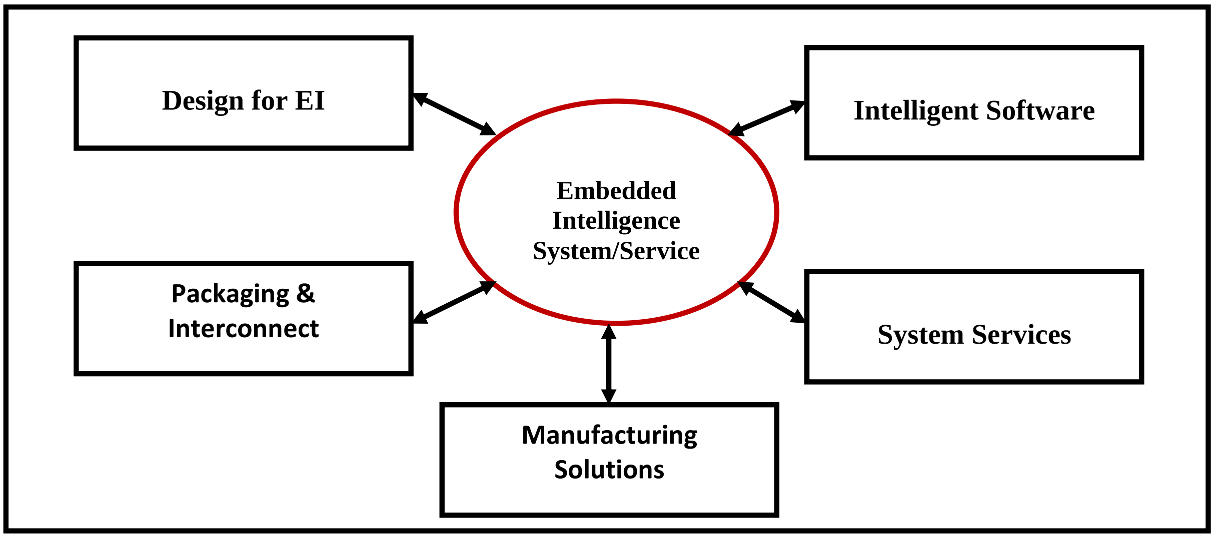

Fig. 2 : Components of embedded intelligence system/service.

Embedded Intelligence is characterised as the ability of a product, process or service to reflect on its own operational performance, usage load, or in relation to the end-user or environment in terms of satisfactory experience. This self-reflection, facilitated by information collected by sensors and processed locally or remotely, must be considered from the design stage such as to enhance the product lifetime and performance, increase quality of process or service delivery, or ensure customer satisfaction and market acceptance [27-30].

Embedded intelligence aims at delivering smarter products, systems or services to industry through their integration and purposeful use for a given application. The various components/processes of embedded intelligence (EI) system/service application are design for EI, intelligent software, packaging & interconnect, manufacturing solutions and/or system services (figure 2). This integration can be realised by:

- **Construction** whereby integrated assemblies show an irreversible and intimate fusion of technologies, as for example in semiconductor integrated circuits more than predicted systems by 'Moore' are build directly upon semiconductor devices.
- **Combination** of functions whereby products are allowed to exploit multiple capabilities for improvements in use. An example would be the touch screen that combines actuation with indication.
- **Connection** whereby the propagation of information from one product sub-element, system product or service to another is carried by wires, radio, photonic or other communication media such as sound or chemical signatures.

Embedded Intelligence can serve many purposes:

- The monitoring of the health and usage of products and high value assets.
- The ease of use of a product, system or service.
- The market appeal and acceptance where a product becomes fashionable, an example of which would be the tablet which regained popularity by the addition of enhanced services, ergonomic design in terms of shape and functionality, and enhanced aesthetics.
- The ability for a service, system or product to be used by ageing, disabled or previously socially excluded people.

While currently it is relatively immature as a technology, according to various sources the Internet of Things is likely to see the number of connected objects reach 50 billion by 2020. The integration of embedded processors with sensors, intelligence, wireless connectivity and other components with high level operating systems, middleware and system integration services is regarded as a new breed of electronics by Intel. They predict that over the next 10 years "IT devices for industries including medical, manufacturing, transportation, retail, communication, consumer electronics and energy will take a development direction that makes intelligent designs become a part of all of our lifestyles".[5] Accordingly they forecast a significant growth for embedded systems in future years. Data also reported by IDC forecasts the worldwide value of the Embedded Systems market to be worth €1.5 trillion in revenue by 2015 with the automotive, industrial, communications and healthcare sectors featuring prominently as users. Even homes without a computer are really filled with computers. The digital devices just don't have keyboards and screens, since they're buried inside stereos, vacuum cleaners, microwave ovens, and almost anything else that plugs into the wall or runs on batteries. Today, these chips are silent, isolated islands. Tomorrow, they'll be jabbering back and forth, helping to make life a lot easier for us humans.

Wireless-communications technology is wrapping the earth in layer upon layer of interconnectivity. And those tiny chips embedded in everyday gadgets will keep getting more powerful. Soon, the anonymous chips will get smart and be aware of their silicon neighbors, which is possible with the help of integrated sensors and wireless telecom systems. For example, the bedroom clock will just need to reach the phone to check on traffic patterns and flight schedules before deciding whether it should fiddle with its alarm time. Similarly when rechargeable toothbrush detects signs of a cavity, it can send signals through the electrical wiring and get in electronic daybook to consult with dentist's digital appointment book, then display a few options on the bathroom mirror. Software agents with embedded intelligence will roam the wireless Web, autonomously managing most routine business and household chores. For example, if a product-design problem come up at work, the smart-card companion in the that place will be informed, and it will activate the display circuits in the paint on the nearest wall to display instead of using an electronic fold-up display. Welcome to tomorrow's world of embedded intelligence as a breakthrough technology of 21st century [31-32].

(4) HIV Antivirus :

Satisfactory and complete curing of HIV by discovering a suitable antivirus as one of the anticipated and most required technology breakthroughs of this century. With just 10 genes wrapped in a coating of protein and sugar, the virus that causes aids (left) has managed to stay several steps ahead of humanity's best efforts to control it. More than 55 million people have been infected around the world. But medicine is beginning to control this deadly scourge--with implications that go beyond aids. For instance, scientists have uncovered the wily molecular tricks HIV uses to slip its own genes into cells. That has enabled companies to devise drugs capable of blocking viral entry. The unprecedented research effort is also dramatically boosting our understanding of the immune system. In aids, clever new vaccines based on that knowledge are already offering the hope that the body could keep the virus in check on its own. And the aids breakthroughs will catalyze development of treatments for other diseases as well. Intensive research are going on at several laboratories to develop suitable antivirus dosage for permanent cure of HIV/AIDS [33-34]. Scientists caution that a permanent cure for aids is still a dream. But new drugs, vaccines, and a growing international commitment to fight the illness as both a health and an economic problem should finally end this epidemic--and also help improve the public health infrastructure enough to tame malaria and other terrible diseases [35].

(5) Pseudo Senses :

Sensation of existence through virtual reality, through artificial environment, Virtual reality is neat, but virtualized reality will be still better. There was a hint of what's coming during last January's Super Bowl game, when 30-odd video cameras were synchronized to produce Matrix-like replays, using technology developed at Carnegie Mellon University. CBS is working to refine the system, and eventually viewers may be able to ride a football on its way from quarterback to receiver, as well as sit next to their favorite jazz pianist during a performance [36]. Then comes the real fun. Drawing on the computational sea that will envelop tomorrow's world, technology will spawn alternate realities. Michael L. Dertouzos, head of the Laboratory for Computer Science at Massachusetts Institute of Technology, predicts that virtualized reality will restore the sense of shared community that people had before we began sequestering ourselves in front of tv sets and computer screens. Only this time, communities won't be defined by physical proximity. Geography will become immaterial. For example, nanoscale sensors and simulators could relay all the sensations of being in California's Muir Woods. Dozens of fellow bird watchers could be gathered among the sequoias with you, observing native species. When you must physically travel far from home, an array of pseudo senses could enable intimate encounters with your lover, indistinguishable from reality. For amusement, there would be a library of adventure experiences. Instead of watching a travelogue about the South Pacific, you'd wirelessly download signals that would provide all the pleasant sensations of walking along a beach in Tahiti. No doubt, some people will still want the job of recording the original sensations [2,37].

In pseudoscience literature one frequently encounters the claim that there are some people, called "sensitives" or psychics," who somehow can pick up the thoughts of others and even transmit their own thoughts to people who are not "sensitives." This direct mind-to-mind communication is sometimes claimed to be instantaneous, and independent of distance. It is also often claimed that all people -- and even domestic animals such as cats, dogs, and horses -- possess this ability to some degree, and that ordinary coincidences are in fact no ordinary, but rather mysterious demonstrations of this supposed ability. (For example, one suddenly thinks of Uncle Charlie for the first time in years, and then later learns that Uncle Charlie was in a serious accident at about the time he mysteriously sprang to mind.) All such pseudoscientific discussions of ESP or telepathy also claim that it is "proven beyond a doubt" that ESP or telepathy exists. The "proof" quoted is usually of an anecdotal variety -- that is, a large collection of unverifiable stories like the "Uncle Charlie" story above. Sometimes, however, it is claimed that "scientific tests" at "respected" research institutions have conclusively demonstrated that ESP exists; or "government tests" have proved it; or, that the Russians are "working hard" on it; or, that the CIA uses it, etc., etc. Sometimes, but rarely, specific experiments are cited as having confirmed the existence of telepathy, clairvoyance, precognition, telekinesis, or other such "supernatural" abilities in humans or animals. Serious questions can be raised concerning all the claims listed above. First, it is the essentially unanimous opinion of psychologists that the existence of ESP has not been shown in any experiment conducted to date. In fact, all procedurally valid and reproducible experiments have failed to demonstrate the existence of any non-sensory channel for information; in experiments where fraud and trickery are ruled out by tight controls, no "extrasensory" abilities are ever demonstrated, even by world-famous "psychics."

It is also important to realize that the existence of an ESP ability in humans or other animals would not be consistent with *anything* we know about nature, either from the standpoint of physics or from the standpoint of physiology. Let us consider the physiological aspect first. All of the "higher" animals show the same fundamental organization of their sensory systems. The specialized cells (neurons) that form the central nervous system (CNS) of man and other higher animals are themselves insensitive to sensory stimuli. For each kind of important stimulus in the environment, animals have evolved highly specialized sensory organs. Each such sense organ contains unique, highly adapted cells that are sometimes called "transducers." Each stimulus in the environment involves a special kind of cellular activity. Vision involves direct detection of particles of light (photons). Hearing involves direct detection of organized, wave motion of air molecules. Smell and taste involve direct detection of molecular shapes. Sensory organs (eyes, ears, and nose) support the cells that are specialized to detect photons, molecular motion, and molecular shapes directly. These cells generate impulses that travel along nerve fibers and which are then processed in intermediate switching and coding areas, finally reaching the brain in a form that can be interpreted by brain cells.

The point is that the brain itself is insensitive to sensory information. If one opened a skull and exposed the brain to light, sound, heat, smells, etc., the brain would be totally unaware of the application of these stimuli directly to its tissues. For obvious reasons, the sensory organs containing the transducer cells are located at or near the surface of the body in all animals, including humans. When we apply this universal rule of nature concerning information input to the brain to claims for telepathy, we come up short on all accounts. Assume that some kind of "something" is radiated from a person's brain as he or she thinks. How would another person's brain ever know about it? Nowhere on the surface of the body is there a specialized organ that appears to lack a function, and which contains transducer cells sensitive to "unknown forces." Nor, contrary to popular myth, is there any large area of the brain whose function is unknown, and which might be responsible for reception and interpretation of signals from the hypothetical ESP organ. Furthermore, in the course of evolution many kinds of animals have developed extremely acute senses of one kind or another, compared to those of humans. Dogs have much more highly developed sense of smell than do humans; hawks and eagles, more acute eyesight; bats, much wider range of hearing, etc. Where is the animal that has a much more highly developed ESP-sense than humans? In fact, the ability to sense the presence of predatory animals that could not be seen, heard, or smelled would confer such enormous advantages for its possessors that the evolution should have made ESP as common as four, claws and moist noses. It has not happened. Could it be that no such sense organ exists because there is no stimulus for the organ to detect? Some persons argue that only human beings are capable of ESP communication; or, that only certain, special persons are so endowed. Comparative anatomy fails to show any evidence for either contention. A proponent of ESP could argue that telepathy differs from all other senses in that the brain itself is the telepathic sense organ. In this case the detected stimulus would require the penetrating power of X-rays or nuclear radioactivity in order to get through the skull to reach the brain! This brings us to the realm of physics, where ESP falls down as badly as in the realm of physiology.

Cognitive science through virtual reality represents an awesome look into our future. New theories about functions of our brain are unfolding at increasingly rapid intervals. Some experts believe a new understanding of the brain will lead to the creation of truly intelligent machines. Others suggest far-out technologies such as "Neural Virtual Reality” (NVR). NVR takes existing virtual reality technology to the next level by pumping virtual environments directly into the brain with neural implants. Transmitted signals trick the brain into believing the body is actually participating in a simulated experience. The implant tells the brain what the body is hearing and how it should feel. With all sensory inputs provided by NVR, a sufficiently realistic simulation is indistinguishable from reality, much like a dream. Today, we cannot even conceive all the applications that this extreme technology could provide. However, cognitive science promises a truly "magical future” for all to enjoy [38-40].

(6) Off Planet Production in micro-gravity :

Orbiting 220 miles above the Earth, the International Space Station offers more than just a spectacular view. It also gives scientists the chance to conduct research in the near absence of gravity. The result could be everything from new plant varieties to important new synthetic materials. Gravity, it turns out, is such a strong and pervasive force that it masks many interesting physical properties, including those related to combustion. In the space station, where gravity has only one-millionth the strength it has on Earth, hot gases do not rise, so flames are spherical and stable--and thus easier to study. Such flames can be used to create novel "combustion-synthesized" materials. One such material is a ceramic that could serve as an artificial bone. Powders are mixed and ignited to make the material, which is much more uniform when made in microgravity than when made on Earth. Researchers have also found that a rose is a rose except when it's grown in space. A rose carried aboard a 1998 shuttle flight had a different scent than roses grown on Earth. That heavenly fragrance was later synthesized on Earth and has already been used in a commercial perfume. Thus off-planet production in micro-gravity space may provide new varieties of plants, new structures & colour combinations of flowers, new breed of seeds and even new community of animals. It is anticipated that in 21st century such possibilities will be completely explored [41-45].

(7) Protein Maps to know how many active genes are coding for proteins in living being :
The decoding of the human genome has barely been completed but already scientists are delving into biology's next challenge: proteomics, the large-scale study of proteins. The goal is to understand the functions of the million or so proteins in the human body. With this knowledge, researchers say they can devise treatments to diagnose and eventually eliminate many diseases [46, 2]. Mapping the human proteome is a monumental task. It will require hundreds of millions of dollars in investment and untold trillions of computations. The molecular contrasts tell the whole story: The human genome is made of DNA--simple, linear molecules containing just four basic constituents. Proteins, on the other hand, are exquisitely complicated structures wrought from 20 different building blocks called amino acids. These molecules fold their hundreds of thousands of atoms into precise configurations that can perform specific cellular tasks--building cellular structures, for example, or charging into the bloodstream as disease-fighting antibodies.

The natural origami underlying large proteins such as Factor VIII (left)--a common clotting factor in the blood--is so complex that scientists cannot yet predict the pattern, even with the help of the most powerful supercomputers. But solving the protein-folding mystery will yield insights into numerous diseases, including Parkinson's, Alzheimer's, and mad cow. And the more they learn about proteins, the closer they come to curing killers such as breast cancer and diabetes [47-51].

(8) Customized Kids which is used for Customization of Physical and mental ability of children :
We all desire perfect lives for our children. So is there anything wrong with giving them every edge we can afford to ensure their success, be it sending them to the best private schools or hiring top tennis pros to train them? What about removing genetic flaws before they're born? Deciding how and when to meddle with genes may raise the most difficult ethical questions facing humankind in the third millennium. Now that the human genome has been deciphered, it won't be long before parents try to take the guesswork out of bearing children. Already, several doctors have announced efforts to attempt human cloning, making an exact genetic copy of anyone who hands over his or her dna. Other scientists are furiously working to perfect "germline" engineering, in which a gene would be permanently removed, added, or altered in an embryo, ensuring that certain genetic traits would or would not be replicated in all future generations [52-55]. Surprisingly, cloning has already gained support from some doctors and ethicists as an infertility treatment of last resort. Germline engineering, though, raises more concerns. It may sound okay for parents with deadly hereditary diseases to pluck out the offending gene from an embryo. But where might that lead? Deep-pocketed parents could use the same technology to modify children in all sorts of ways, attempting to add genes for athletic prowess or intelligence, creating a social divide of genetic haves and have-nots. Princeton University biologist Lee M. Silver even predicts that, far down the road, we could end up with a

new race of reengineered people who might not be able to breed with those whose genetic makeup was left to chance. Don't be surprised if another Cabinet post is created to regulate all this: Secretary of Human Nature [56-57].

(9) Development of Chameleon Chips which are reconfigurable photonic circuits using the idea of optical solitons :

No one denies that computers are speedy critters. For some chores, though, faster is always better. So computer scientists are hatching a novel concept that could increase number-crunching power--and trim costs as well. Call it the chameleon chip [2, 58]. Today's microprocessors sport a general-purpose design, which is both good and bad. Good: One chip can run a range of programs. That's why you don't need separate computers for different jobs, such as crunching spreadsheets or editing digital photos. Bad: For any one application, much of the chip's circuitry isn't needed, and the presence of those "wasted" circuits slows things down. Suppose, instead, that the chip's circuits could be tailored specifically for the problem at hand--say, computer-aided design--and then rewired, on the fly, when you loaded a tax-preparation program. One set of chips, little bigger than a credit card, could do almost anything, even changing into a wireless phone. The market for such versatile marvels would be huge, and would translate into lower costs for users.

Chameleon chips would be an extension of what can already be done with field-programmable gate arrays (FPGAS). An FPGA is covered with a grid of wires. At each crossover, there's a switch that can be semipermanently opened or closed by sending it a special signal. Usually the chip must first be inserted in a little box that sends the programming signals. But now, labs in Europe, Japan, and the U.S. are developing techniques to rewire FPGA-like chips anytime--and even software that can map out circuitry that's optimized for specific problems. The chips still won't change colors. But they may well colour the way we use computers in years to come [59-63].

(10) Flying cars through manipulation of gravitational force :

The absence of flying cars speaks to a failure of engineering or distorted incentives in the marketplace. But the humbling truth is that we don’t have these vehicles because we still don’t know, even in principle, how to directly manipulate gravity. Indeed, the cars missing from our skies should serve to remind us that, to a degree rarely appreciated, we have surprisingly poor control over most of nature’s fundamental forces [64]. Physicists have compiled a comprehensive inventory of all the ways things can pull or push on other things, a complete itemization of nature’s forces. They’ve found just four. The first is gravity, the force that keeps your feet on the ground. The second is electromagnetism, which is responsible for anything involving light or the arrangement of atoms. The third is the strong nuclear force, which binds protons and neutrons together inside every atom. And the fourth is the weak nuclear force, which (among other things) helps guide the fusion reactions that power stars.

For all the power of modern science, we are masters of only one of these forces: electromagnetism. Laptops, smartphones, wirelessly connected thermostats, Google Glass - all our high-tech miracles exist because we’ve learned to control the electromagnetic force at the subtlest of levels. We routinely nudge electrons around circuits with the precision of an atomic watchmaker and coerce light to do our bidding with the barest of whispers. When it comes to electromagnetism, we have powers that are almost godlike. With the other three, we're not even close. For example, nuclear power plants rely on our remarkable knowledge of the strong and weak nuclear forces. But when all is said and done they simply use the heat generated by splitting atomic nuclei to boil water, which then spins turbines, which then generate electricity. That's not so different from a 19th-century steam engine. Compared with the precision of an electron microscope (or even a grocery-store laser scanner), our handling of nuclear forces is still at the level of slamming rocks together. The same is true of gravity. Obviously, we can make a plane fly by forcing air to flow over a wing, which generates the pressure to lift it off the ground. But the interaction of those air molecules is a result of electromagnetic forces and the fuel we use to power planes & blow rockets off the planet is a result of our understanding of chemistry, which again is a matter of electromagnetism.

Thus all our ways of flying involve a heavy-handed application of the electromagnetic force through fuels and engines. The noise, the danger, the pollution and the inefficiency that accompany the current ways of flying are a testament to our crude approach to defying gravity.
The problem is that we don't really understand gravity at its most fundamental level. Much as a seemingly smooth shoreline is actually composed of quintillions of individual sand grains, every aspect of the world - matter, energy and motion - is actually parceled into infinitesimal building blocks. The four forces that shape the world come in little packages, too. With electromagnetism and the nuclear forces, we understand how the parceled behavior, the quantum mechanics of these forces works. And the digital culture we've built rests directly on our ability to understand and manipulate electromagnetism's quantum manifestations. But with gravity we remain in the dark. We have no theory of quantum gravity and without the ability to manipulate the quantum gravitational world, we won't be gliding around in the silky hush of hover-cars anytime soon. Instead we will have to fly the old-fashioned electromagnetic way. Hence, all our technological powers, we are still constrained by the deepest structures underlying physical reality. If one force can be easily manipulated at room temperature but another requires the power of a cosmic explosion, then those are facts we just have to work with [65-68].

(11) Immortality through nano-bio-technology & stem cell research :

Immortality is eternal life or the ability to live forever. Biological forms have inherent limitations which medical interventions or engineering may or may not be able to overcome. Natural selection has developed potential biological immortality in at least one species, the jellyfish. Certain scientists, futurists, and philosophers, have theorized about the immortality of the human body, and advocate that human immortality is achievable in the first few decades of the 21st century, while other advocates believe that life extension is a more achievable goal in the short term, with immortality awaiting further research breakthroughs into an indefinite future. newly developing technologies may be used to induce biological immortality in human beings. *Human embryonic stem cells* generated considerable excitement since they were a means of mass-producing replacement cells for the treatment of a host of degenerative diseases involving the loss or dysfunction of cells, including those in osteoarthritis, macular degeneration, diabetes, heart failure, Parkinson's disease, and numerous other disorders. The first report of the isolation of these cells marked the birth of the new field called *regenerative medicine*. When perfected, this technology offered the theoretical potential of rejuvenating an entire human body back to a youthful state**.** Hence *immortality* is the ultimate goal of ideal technology so that it can create an avenue for deathless situation or enhancement of human life span [69-72].

There are two ways in which nanotechnology may be able to extend our lives. One is by helping to eradicate life-threatening diseases such as cancer, and the other is by repairing damage to our bodies at the cellular level--a nano version of the fountain of youth. The most exciting possibility exists in the potential for repairing our bodies at the cellular level. Techniques for building nanorobots are being developed that should make the repair of our cells possible. For example, as we age, DNA in our cells is damaged by radiation or chemicals in our bodies. Nanorobots would be able to repair the damaged DNA and allow our cells to function correctly. This ability to repair DNA and other defective components in our cells goes beyond keeping us healthy: it has the potential to restore our bodies to a more youthful condition. The extension of the human lifespan could be facilitated through the removal of a substance called lipofuscin from certain types of non-dividing cells, including the brain, heart, liver, kidneys and eyes. Lipofuscin is a metabolic end product that accumulates primarily within lysosomes (the garbage disposal organelles within cells). It's thought that when lipofuscin accumulates to certain levels, it begins to negatively impact cell function, which eventually manifests in many age related conditions. Aubrey de Grey et al. have proposed that soil bacterial enzymes might have the capacity for degrading lipofuscin. It is proposed that humans might live as long as 1,000 years under the appropriate rejuvenative therapies. In 30 or 40 years, we'll have microscopic machines traveling through our bodies, repairing damaged cells and organs, effectively wiping out diseases. The nanotechnology will also be used to back up our memories and personalities. And in 35 to 40 years, we basically will be immortal [73-77].

(12) Fractal Models which are mathematical models used to represent fragmented geometry shapes :

Clever mathematical techniques are the foundation of increasingly realistic computer models and simulations. Now, math research is on the verge of creating tools that mathematicians hope will cut two ways: help scientists unlock explanations to many phenomena that remain mysterious and produce new modeling systems that could revolutionize product development and manufacturing. All this could be coming from fractals, those crinkly lines that look the same no matter how much they're magnified. "Fractal" is the term mathematicians use for patterns that repeat on all scales--like the spikes on a fern leaf that could be tiny copies of the fern itself [78 - 80]. Fresh research indicates that such recurring patterns may be more fundamental in nature than had been thought. If the new insights can be captured in fractal algorithms, science could gain extraordinary new powers. The same basic formulas could be "exploded" in scope to help scientists better understand large-scale systems such as the influence on climate from patterns of sunlight reflecting off the ocean's surface. And they could predict traffic flows on the Internet, or on physical highways. Conversely, "imploding" the formulas would adapt them for small-scale use, such as the behavior of molecules. That could save time in r&d by pointing out which avenues are more promising. Designers and engineers could update near-perfect models to speed their work on new products and processes [81-82].

(13) Space travel for everybody :

The earthly challenges facing humanity are the result of our heavy demand on resources and raw materials. Many of these materials can be found in space but the expense to extract them is a major barrier. In addition to cost, other obstacles to developing space are safety, reliability, and performance. According to the National Space Society there are four reasons why we need to pursue space exploration and colonization. These reasons—survival, growth, prosperity and curiosity—all point to the fact that we, as a species, want more room. Space exploration will give us a means to monitor the health of our planet, a source of resources and an outlet for our imagination. Using carbon nanotubes to make the cable needed for the space elevator, a system which could significantly reduce the cost of sending material into orbit. Nanotechnology will create the ability for humans to operate in space more safely. Applications where nanotechnology will impact space exploration are propulsion fuels, coatings, structural materials, smart uniforms, electronics and life support environments. These will be more efficient, stronger, self-healing and lighter than what is currently available [83-88].

III EFFECT OF ABOVE TECHNOLOGY BREAKTHROUGHS IN LIFESTYLE OF PEOPLE IN THE SOCIETY

Nanotechnology breakthroughs are expected to change the present lifestyle to a greater extent. The general purpose nature of nanotechnology and its advantages in solving both basic and advanced problems in all realm of society including, scientific, engineering, agricultural & food, medical & biomedical, building materials, electronics, cleaner air & water, renewable energy & storage, consumer products, automobiles & space technology, defense, and civil & mechanical engineering manufacturing will provide opportunity to find optimum solutions to many problems in the society. The anticipated breakthroughs in nanotechnology as central technology along with its related technologies like Optical Computation , Embedded Intelligence, Chameleon Chips, Flying cars, Immortality through nano-bio-technology, Space travel and other independent technologies like HIV Antivirus, Pseudo Senses, Off Planet Production, Protein Maps, Customized Kids, and Fractal Models will eradicate poverty & deceases in the society and fuel to the development of advanced homogeneous society completely different thinking and lifestyle compare to present day society.

Optical Computing will bring faster computers, better storage and communications, advanced artificial intelligence, and simpler ways of interfacing new software and hardware – including connecting radical new applications from machines directly with our bodies. One day, possibly by the end of 21st century or sooner, it will be possible to merge computer programs into our dreams. Computer-assisted dreaming could enable us to create dreams that we could share with others. Interactive shared dreaming could become a popular leisure pursuit.

Similarly the anticipated breakthrough in off-planet production in micro-gravity may provide new varieties of plants, new structures & colour combinations of flowers, new breed of seeds and even new community of animals and such possibilities will provide new opportunities in further research in science & technology as well as in business processes & industries. This will definitely effect the life style of human beings in terms of solutions to both basic needs and advanced comforts. The people in the society may get more varieties of products and services to make their life more happy and comfortable.

Similarly the anticipated breakthrough in decoding of the human genome and producing artificial proteins through *protein mapping* will provide opportunity of discovering artificial food and curing many cruel deceases of human being which may lead to hungry-less and decease free, happy and comfortable society. "If we live 20 more years, probably, we may never die”. How new technology break through might play out in human life in the process of improving happiness and comfort during 21st century resulting from new innovations in above 13 areas.

Nearly all diseases will become curable during this period; replacing aging and worn body parts will become common practice leading to *immortality*. By the end of 21st century it is believed that, most adults will look forward to a radically increased lifespan with near-perfect health.

As the global economy continues to be transformed by new technology breakthroughs, a keen competition will develop for talent, intellectual property, capital and technical expertise. Many of these factors responsible for shaping how nations compete, interact and trade. Technical innovations will increasingly shape economies and market robustness. Technology will continue to drive global and domestic development. Competition will be fueled increasingly by fast breaking innovations in technology and its adoption. If the proliferation of present technologies to form new business models is any indication of the speed and power of change in the economy, future technology breakthroughs will make for an even more dramatic paradigm shift. The evolution of a techno-economy, as contrasted with the petro-economy of today, is an intriguing idea. Anticipated technology innovations yet to come will set the timeline for this economic transformation. These technology breakthroughs may become integrated into industries and may become an embedded component of new products.

The social acceptance of these technology breakthroughs depends on Geographical Parameters like location, demography, culture, class, etc., Economic Parameters like the market penetration for the technology, its demand etc., Psycho-Social Parameters like people view on given technology, Affective Parameters like comfort level, Cognitive Parameters like awareness of those technologies, Technical Administrative Parameters like process of regulatory measures, Political Parameters like ability to debate, contention and organized opposition to a technology. This also include normative and quasi-normative parameters for the social acceptability of such technology breakthroughs like Religious Acceptability, Cultural Acceptability, and Ethical Acceptability of the effects and consequences of the penetration of these technologies.

IV. CONCLUSION

The thirteen most anticipated breakthrough technologies predicted in this paper are expected to substantially affect the human life in the society during the present century. The predicted discoveries and innovations in Nanotechnology and its six related technologies mentioned in technology breakthrough model and other six independent technologies listed in the model are expected to make drastic changes in everyday life of human beings in the world. From high power & speed computers to space travel, from chameleon chips to flying cars, from embedded intelligence to immortality, solutions to basic problems like food, pure drinking water, renewable energy, health & shelter for everybody, and clean environment through nanotechnology will change the lifestyle of the people. Other independent technologies listed in the model like HIV antivirus, pseudo senses, off-planet production, protein maps, customized kids, and fractal models are also helps to solve many problems of the society and support to solve many other problems. These breakthroughs are expected to create a new community of people called "super-tech-people" with modified social status. This will lead to development of new community without any partiality based on race, religion, country- origin, caste and even gender. The anticipated technology breakthroughs are change all the human beings as god who is ubiquitous, omnipotent and immortal. These breakthrough technologies certainly effect the religious, social, economical, political, cultural and ethical roots of the countries and supports the developments of a new heterogeneous generation as global citizens.

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